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Self-rated health status and cardiorespiratory fitness as predictors of mortality in men

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Abstract

Self-rated health (SRH) and cardiorespiratory fitness (fitness) are independent risk factors for all-cause mortality. The purpose of this report is to examine the single and joint effects of these exposures on mortality risk. The study included 18,488 men who completed a health survey, clinical examination, and a maximal exercise treadmill test during 1987–2003. Cox regression analysis was used to quantify the associations of SRH and fitness with all-cause mortality. There were 262 deaths during 17 years of follow-up. There was a significant inverse trend ($P_{trend} < 0.05$) for mortality across SRH categories after adjustment for age, examination year, body mass index, physical activity, smoking, alcohol consumption, abnormal ECG, hypertension, and hypercholesterolemia, cardiovascular disease, diabetes, and cancer. Adjustment for fitness attenuated the association (*P value* =0.09). We also observed an inverse association between fitness and mortality after controlling for the same covariates and SRH ($P_{trend} = 0.006$). The combined analysis of SRH and fitness showed that fit men with good or excellent SRH had a 58% lower risk of mortality than their counterparts. SRH and fitness were both associated with all-cause mortality in men. Fit men with good or excellent SRH live longer than unfit men with poor or fair SRH.

MeSH Keywords

health status; men; mortality; physical fitness

Competing Interest: None to declare

The World Health Organization set a target for all countries to introduce, actively manage, and monitor programs that enhance healthy lifestyles (1). Self-rated health (SRH) is a relevant construct for a healthy lifestyle and is a question included in many epidemiological studies. SRH is a subjective measure that captures a person's perception of their overall health status. Individuals' perceptions of their health not only incorporate psychological, biological, and social dimensions that are unavailable to the external observer, they also provide a dynamic assessment of their current health status while integrating a trajectory of their health (2–4).

A healthy lifestyle can stabilize SRH and reduce mortality (3, 5–6). SRH also is an independent statistical determinant of mortality due (7). Maddox reported a positive correlation existed between a patient's SRH and the physician's ratings (8). The patient's self-rated health was a strong predictor of future physician's ratings (8). In a cohort of patients with diabetes, SRH was a strong predictor of all-cause mortality and cardiovascular related mortality (9). Even in patients with stable chronic heart failure, SRH had an inverse relationship with mortality (10). Yet these studies did not control for physical activity or cardiorespiratory fitness (hereafter simply fitness), and both of these variables have a protective effect on mortality (11–13).

Some earlier studies have examined the relationship between SRH and physical activity and its association with mortality (2, 6, 14–16). The Whitehall II study showed an equally strong protective effect of SRH on mortality in men and women, while controlling for self-reported physical activity (17). In addition to self-reported physical activity, a 2008 longitudinal analysis of the ilSIRENTE study found a strong association between Short Physical Performance Battery, SRH, and mortality(18).

However, none of the previous studies evaluated the relationship between SRH and mortality while controlling for measured fitness. In addition, we have found no previous studies that investigated the association between fitness and mortality while controlling for SRH. Therefore, the primary research aim of this study was to explore the protective effect of SRH on mortality after controlling for fitness, and *vice versa*. A secondary aim was to investigate whether effect modification was evident.

MATERIALS AND METHODS

Study population

This was a prospective observational study consisting of 18,488 men, ages 20 to 84 years, who completed a baseline examination at the Cooper Clinic, Dallas TX during 1987 to 2003. Study participants came to the clinic for periodic preventative health examinations. The cohort includes few members of minority groups. Most participants come from middle and upper socioeconomic strata (~80% hold a college degree) (19). The study protocol was reviewed and approved annually by the Institutional Review Board at the Cooper Institute.

Clinical examination

All study participants completed a thorough health examination after completion of written informed consent. The medical evaluation, performed after participants had fasted overnight for ≥12 h, included a physical examination, anthropometric measurements, electrocardiogram, blood chemistry analyses, blood pressure assessment, maximal exercise test on a treadmill, self-report of health habits, and recording of demographic characteristics. Additional details of the medical assessment are in previous reports (20–22).

SRH was reported on the medical history. Participants were asked to rate their health based on a single, validated, and widely used question (23–25), "How would you rate your overall

health?" The choices were 'poor', 'fair', 'good', and 'excellent'. We combined poor and fair due to the small number of responses in these categories. Also, for the stratified and final analyses, the responses were dichotomized in to 'poor/fair' and 'good/excellent' and were coded 0 and 1, respectively (9, 23, 26).

Fitness was quantified as the duration of a symptom-limited maximal treadmill exercise test using a modified Balke protocol (20, 27). Total treadmill endurance time was used as an index of aerobic power, with time on treadmill in this protocol highly correlated (r>0.92) with maximal oxygen uptake (VO_2 max) in men (28). We categorized men into three categories depending on their age-specific (20–39, 40–49, 50–59, and ≥60 years) treadmill time from the entire Aerobics Center Longitudinal Study (ACLS): "low (least fit 20%)", "moderate (next fit 40%)", and "high (most fit 40%)". All participants included in the analyses achieved at least 85% of their age-predicted maximal heart rate (220 minus age in years).

Age, year of baseline examination, BMI [body mass index = weight(kg)/height(m)^2], physical activity (PA), smoking, alcohol consumption, abnormal ECG, hypertensions, hypercholesterolemia and incident cancer, cardiovascular disease, and diabetes were controlled in multivariate analyses. Height and weight were measured using a standard physician's scale and stadiometer. Information on smoking habits (never, former, current), alcohol intake (drinks per week), and PA (low, moderate, high) was obtained from questionnaires. The measure of alcohol intake was described in detail in a previous paper (13). Blood pressure was measured by auscultation after at least 5 minutes of sitting quietly. The participants were classified as having a chronic medical condition if they had one or more of the following physician-diagnosed diseases or conditions: abnormal electrocardiogram (ECG), cancer, cardiovascular disease, diabetes, hypertension, and hypercholesterolemia.

Mortality surveillance

All participants were followed for mortality from the baseline examination to the date of death or December 31, 2003. Deaths among study subjects were identified from the National Center for Health Statistics National Death Index.

Statistical analyses

Baseline characteristics of the population were calculated for SRH categories: poor/fair, good, and excellent. Cox proportional hazards regression was used to estimate the hazards ratios (HRs), 95% confidence intervals (CI), and mortality rates (deaths per 10,000 person-years of follow-up adjusted for age and examination year), according to categories of SRH and fitness. Within the first statistical model, age and year of baseline examination were controlled across SRH and fitness categories. The second model was further adjusted for the other aforementioned covariates. In the final SRH and fitness models, fitness and SRH were additionally adjusted for, respectively. The proportional hazards assumption was examined by comparing the cumulative hazard plots grouped on exposure; no appreciable violations were noted. Next, we evaluated the possible effect modification across age (<60 vs. ≥60 years old), smoking status (non-smoker vs. smoker), BMI (<25 vs. ≥25), and chronic medical condition (with vs. without). Finally, we assessed the joint association of SRH and fitness on mortality. Unfit men with a poor/fair SRH were the referent group. All analyses were performed with SAS statistical software, version 9.1 (SAS Inc., Cary, NC).

RESULTS

There were 262 deaths during an average 7.7 years of follow-up. The baseline characteristics of the study population were analyzed according to SRH categories (Table 1). Men with excellent SRH were slightly older than those with poor/fair or good SRH (*P* value <0.001), had a lower BMI (*P* value <0.001), and more likely to be in the high fitness group (*P* value <0.001 for both). SRH and fitness were both shown to have a crude protective effect on mortality with a hazard ratio of 0.72 and 0.59, respectively. After adjusting for age and examination year (Table 2), both SRH ($P_{trend} \leq 0.001$) and fitness ($P_{trend} < 0.001$) continued to be inversely associated with mortality. These relationships remained significant when controlling for the other covariates in the second model. In the final model, when controlling for all covariates and fitness, the trend across SRH groups was only marginally significant (*P*=0.09). The strong inverse gradient for mortality across fitness groups remained in the final model after adjustment for SRH ($P_{trend} = 0.006$).

We also examined the association of SRH and mortality in specific sub-groups of the population (Figure 1). Participants 60 years of age and older who rated their health as good or excellent, had a significantly lower mortality rate than participants in the same age group who ranked their health as poor or fair. Participants diagnosed with one or more chronic medical conditions, such as diabetes or cardiovascular disease, and ranked themselves in good or excellent health had a lower mortality risk than their counterparts who ranked their health as poor or fair. There were no significant differences for SRH groups for the other comparisons.

We then evaluated the combined influence of SRH and fitness on mortality (Figure 2). Men who were fit (moderate or high fit) and had good or excellent SRH had a 58% lower risk of mortality compared to the referent group (unfit men with poor/fair SRH).

DISCUSSION

To our knowledge this is the first study to examine the combined associations of SRH and fitness on mortality. Our primary finding is that SRH and fitness independently predicted mortality after adjusting for several confounders and for each other, although this was of marginal significance for SRH after adjusting for fitness. In addition, men with good or excellent SRH, combined with high fitness, had a 58% lower risk of dying when compared with those with poor or fair SRH and unfit.

A unique finding of this study was the effect of fitness on the relationship between SRH and mortality. SRH, alone, has a protective effect on mortality, but when fitness was added to the model, SRH's protective effect was reduced to marginal significance. This is similar to results reported from an Australian cohort that observed a 45% higher all-cause mortality risk for participants with good SRH who reported a low exercise level compared with the individuals with good SRH and moderate exercise (6). However, our finding of a joint association is not congruent with other studies that reported an independent relationship between SRH and other forms of physical activity with mortality (15, 18).

Previous studies on SRH and mortality show a mortality risk 1.4 to 3.0 times higher for respondents with poor SRH compared with individuals who ranked their health as good (2, 4, 6, 10, 17, 29). In these studies, the prevalence of smoking (22%) in the good SRH group was similar to our findings of 25% (2). A systematic review of 27 studies found that when controlling for cardiovascular risk factors such as ECG, diet history, and blood pressure, SRH was still a significant predictor of all-cause mortality (4). This result is similar to the result presented in Figure 1, indicating that participants with chronic conditions experienced

a lower all-cause mortality risk when they reported their health as good, compared to individuals with poor SRH.

Our results on the association between fitness and all-cause mortality are consistent with previous reports, but extend the literature by accounting for SRH (18). A recently published meta-analysis (30) summarized 33 studies linking fitness to all-cause mortality. Fitness was assessed as maximal aerobic capacity and expressed in metabolic equivalents (METs). The study concluded that the pooled risk for all-cause mortality decreased 13% per 1-MET increment. Also, compared with participants with low fitness, those with high fitness had a 41% lower risk for all-cause mortality in their categorical analyses (30). Other reports originating from the ACLS study also support our findings of a protective effect of fitness on all-cause mortality with approximately 30–70% lower mortality risk in highly fit individuals (19–20, 22, 31–34). While examining the effect of fitness on all-cause mortality, these studies controlled for potential confounders such as BMI, blood pressure, smoking status, and the presence of chronic illness, but not for SRH. Our findings of joint effects of fitness and SRH, indicate that future studies should consider controlling for SRH when investigating the relationship between fitness and mortality.

While no previous studies have examined the joint associations between SRH and objectively measured fitness with mortality, a study in Finland did report the combined effects of SRH and self-perceived fitness on mortality in 1,340 men. The results depict an inverse dose-response relationship between SRH and mortality (2). While controlling for self-perceived fitness, the risk for mortality increased 92% for men reporting poor SRH compared to those reporting good health (2). In our study, men reporting poor health showed a 1.3 times higher risk of all-cause mortality compared to men with good SRH. This dissimilarity in findings may be due to the objective measure of fitness used in the current study, which has less misclassification than self-perceived fitness.

The mechanism between SRH and mortality is not well established. One plausible explanation is the afferent information that conveys messages from the organism to the brain (35). These messages are usually not brought to consciousness because they function at lower levels of the central nervous system. However, this afferent information is perceived by the individual as sensations, feelings, and emotion and is the sense that reflects the physiological condition of the entire body (7, 35). Another theory explaining a person's perceptions of their health involves a family of proteins called cytokines (7). Cytokines are involved in inflammation processes and play a major role in infectious conditions and also the pathogenesis of many chronic diseases. Research is beginning to show that the inflammatory process and certain cytokines are associated with tiredness, impaired sleep, depressive mood, and poor appetite (7, 36).

To the best of our knowledge, this investigation is the first study to examine the combined effect of SRH and fitness on mortality. The present study expands on previous findings by showing strong independent associations of SRH and fitness with mortality. This investigation was conducted using the ACLS, a large prospective study with a relatively long follow-up period, objective measures of fitness and other potential health covariates, and thorough baseline clinical examinations by a physician to detect underlying disease conditions. One limitation of the current study is the homogeneity of sociodemographic factors in our population. While this increases internal validity by controlling for potential confounders, caution must be used in generalizing the results too broadly. Along with this limitation, a time trend limitation may exist. Due to the span of 17 years of baseline data collection, a higher expectation concerning individual health might have been present in 2003 compared with earlier examinations (7).

We found that both SRH and cardiorespiratory fitness were strong, independent predictors of all-cause mortality. Participants with one or more chronic diseases/conditions such as abnormal ECG, cancer, cardiovascular disease, diabetes, hypertension, or hypercholesterolemia had a lower mortality risk when they reported good/excellent SRH, compared with peers who reported poor/fair SRH. The combined association of good or excellent SRH and moderate or high fitness had a 58% lower mortality risk when compared with men who had poor or fair SRH and were unfit. Health professionals might need to pay attention to patients' SRH and assess their fitness level as well for risk stratification.

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Abbreviations

BMI	body mass index
CI	confidence interval
fitness	cardiorespiratory fitness
SRH	self-rated health

References

1. van Herten LM, van de Water HP. New global Health for All targets. BMJ. 1999; 319:700–3. [PubMed: 10480832]
2. Miilunpalo S, Vuori I, Oja P, et al. Self-rated health status as a health measure: the predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. J Clin Epidemiol. 1997; 50:517–28. [PubMed: 9180644]
3. de Groot LC, Verheijden MW, de Henauw S, et al. Lifestyle, nutritional status, health, and mortality in elderly people across Europe: a review of the longitudinal results of the SENECA study. J Gerontol A Biol Sci Med Sci. 2004; 59:1277–84. [PubMed: 15699526]
4. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. J Health Soc Behav. 1997; 38:21–37. [PubMed: 9097506]
5. Kaplan GA, Goldberg DE, Everson SA, et al. Perceived health status and morbidity and mortality: evidence from the Kuopio ischaemic heart disease risk factor study. Int J Epidemiol. 1996; 25:259–65. [PubMed: 9119550]
6. Ford J, Spallek M, Dobson A. Self-rated health and a healthy lifestyle are the most important predictors of survival in elderly women. Age Ageing. 2008; 37:194–200. [PubMed: 18063655]
7. Jylha M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. Soc Sci Med. 2009; 69:307–16. [PubMed: 19520474]
8. Maddox GL, Douglass EB. Self-assessment of health: a longitudinal study of elderly subjects. J Health Soc Behav. 1973; 14:87–93. [PubMed: 4708417]
9. McEwen LN, Kim C, Haan MN, et al. Are health-related quality-of-life and self-rated health associated with mortality? Insights from Translating Research Into Action for Diabetes (TRIAD). Prim Care Diabetes. 2009; 3:37–42. [PubMed: 19269911]
10. Farkas J, Nabb S, Zaletel-Kragelj L, Cleland JG, et al. Self-rated health and mortality in patients with chronic heart failure. Eur J Heart Fail. 2009; 11:518–24. [PubMed: 19329804]
11. Janssen I, Jolliffe CJ. Influence of physical activity on mortality in elderly with coronary artery disease. Med Sci Sports Exerc. 2006; 38:418–7. [PubMed: 16540827]

12. Lyerly GW, Sui X, Lavie CJ, et al. The association between cardiorespiratory fitness and risk of all-cause mortality among women with impaired fasting glucose or undiagnosed diabetes mellitus. Mayo Clin Proc. 2009; 84:780–6. [PubMed: 19720775]
13. Katzmarzyk PT, Church TS, Blair SN. Cardiorespiratory fitness attenuates the effects of the metabolic syndrome on all-cause and cardiovascular disease mortality in men. Arch Intern Med. 2004; 164:1092–7. [PubMed: 15159266]
14. Woo J, Ho SC, Yu AL. Lifestyle factors and health outcomes in elderly Hong Kong chinese aged 70 years and over. Gerontology. 2002; 48:234–40. [PubMed: 12053113]
15. Mason C, Katzmarzyk PT, Craig CL, et al. Mortality and self-rated health in Canada. J Phys Act Health. 2007; 4:423–33. [PubMed: 18209233]
16. Johansson SE, Sundquist J. Change in lifestyle factors and their influence on health status and all-cause mortality. Int J Epidemiol. 1999; 28:1073–80. [PubMed: 10661650]
17. Singh-Manoux A, Gueguen A, Martikainen P, et al. Self-rated health and mortality: short- and long-term associations in the Whitehall II study. Psychosom Med. 2007; 69:138–43. [PubMed: 17289825]
18. Cesari M, Onder G, Zamboni V, et al. Physical function and self-rated health status as predictors of mortality: results from longitudinal analysis in the ilSIRENTE study. BMC Geriatr. 2008; 8:34. [PubMed: 19102751]
19. Kampert JB, Blair SN, Barlow CE, et al. Physical activity, physical fitness, and all-cause and cancer mortality: a prospective study of men and women. Ann Epidemiol. 1996; 6:452–7. [PubMed: 8915477]
20. Blair SN, Kohl HW 3rd, Paffenbarger RS Jr, et al. Physical fitness and all-cause mortality. A prospective study of healthy men and women. JAMA. 1989; 262:2395–401. [PubMed: 2795824]
21. Blair SN, Kohl HW 3rd, Barlow CE, et al. Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. JAMA. 1995; 273:1093–8. [PubMed: 7707596]
22. Blair SN, Kampert JB, Kohl HW, et al. Influences of cardiorespiratory fitness and other precursors on cardiovascular disease and all-cause mortality in men and women. JAMA. 1996; 276:205–10. [PubMed: 8667564]
23. Piko BF, Keresztes N. Self-perceived health among early adolescents: role of psychosocial factors. Pediatr Int. 2007; 49:577–83. [PubMed: 17875079]
24. Kaleta D, Makowiec-Dabrowska T, Dziankowska-Zaborszczyk E, et al. Physical activity and self-perceived health status. Int J Occup Med Environ Health. 2006; 19:61–9. [PubMed: 16881600]
25. Okano G, Miyake H, Mori M. Leisure time physical activity as a determinant of self-perceived health and fitness in middle-aged male employees. J Occup Health. 2003; 45:286–92. [PubMed: 14646269]
26. Batty GD, Lewars H, Emslie C, et al. Internationally recognized guidelines for ‘sensible’ alcohol consumption: is exceeding them actually detrimental to health and social circumstances? Evidence from a population-based cohort study. J Public Health (Oxf). 2009; 31:360–5. [PubMed: 19574275]
27. Balk B, Ware RW. An experimental study of physical fitness in Air Force personnel. US Armed Forces Medical Journal. 1959; 10:675–88.
28. Pollock ML, Bohannon R, Cooper KH, et al. A comparative analysis of four protocols for maximal treadmill stress testing. American Heart Journal. 1976; 92:39–46. [PubMed: 961576]
29. Idler EL, Angel RJ. Self-rated health and mortality in the NHANES-I Epidemiologic Follow-up Study. Am J Public Health. 1990; 80:446–52. [PubMed: 2316767]
30. Kodama S, Saito K, Tanaka S, et al. Cardiorespiratory fitness as a quantitative predictor of all-cause mortality and cardiovascular events in healthy men and women: a meta-analysis. JAMA. 2009; 301:2024–35. [PubMed: 19454641]
31. Lee CD, Blair SN, Jackson AS. Cardiorespiratory fitness, body composition, and all-cause and cardiovascular disease mortality in men. Am J Clin Nutr. 1999; 69:373–80. [PubMed: 10075319]
32. Lee DC, Sui X, Ortega FB, et al. Comparisons of leisure-time physical activity and cardiorespiratory fitness as predictors of all-cause mortality in men and women. Br J Sports Med. 2010

33. Byun W, Sieverdes JC, Sui X, et al. Effect of Positive Health Factors and All-Cause Mortality in Men. Med Sci Sports Exerc. 2010

34. Lee CD, Sui X, Blair SN. Combined effects of cardiorespiratory fitness, not smoking, and normal waist girth on morbidity and mortality in men. Arch Intern Med. 2009; 169:2096–101. [PubMed: 20008693]

35. Cameron OG. Interoception: the inside story--a model for psychosomatic processes. Psychosom Med. 2001; 63:697–710. [PubMed: 11573016]

36. Dantzer R, O'Connor JC, Freund GG, et al. From inflammation to sickness and depression: when the immune system subjugates the brain. Nat Rev Neurosci. 2008; 9:46–56. [PubMed: 18073775]

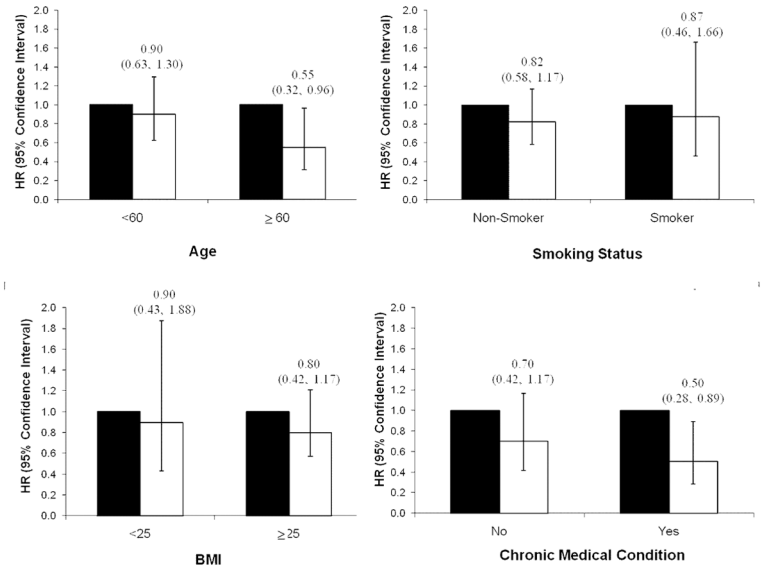

Figure 1.

Multivariate-adjusted hazard ratio (HR)* and 95% confidence interval (CI)* of all-cause mortality by age, smoking status, body mass index, and chronic medical conditions. White bars represent Poor/Fair SRH, and black bars represent Good/Excellent SRH and the lines indicate 95% confidence intervals.

*Adjusted for age, examination year, BMI, physical activity, smoking, alcohol consumption, abnormal electrocardiogram, cancer, cardiovascular disease, diabetes, hypertension, and hypercholesterolemia. BMI, body mass index; SRH, self-rated health.

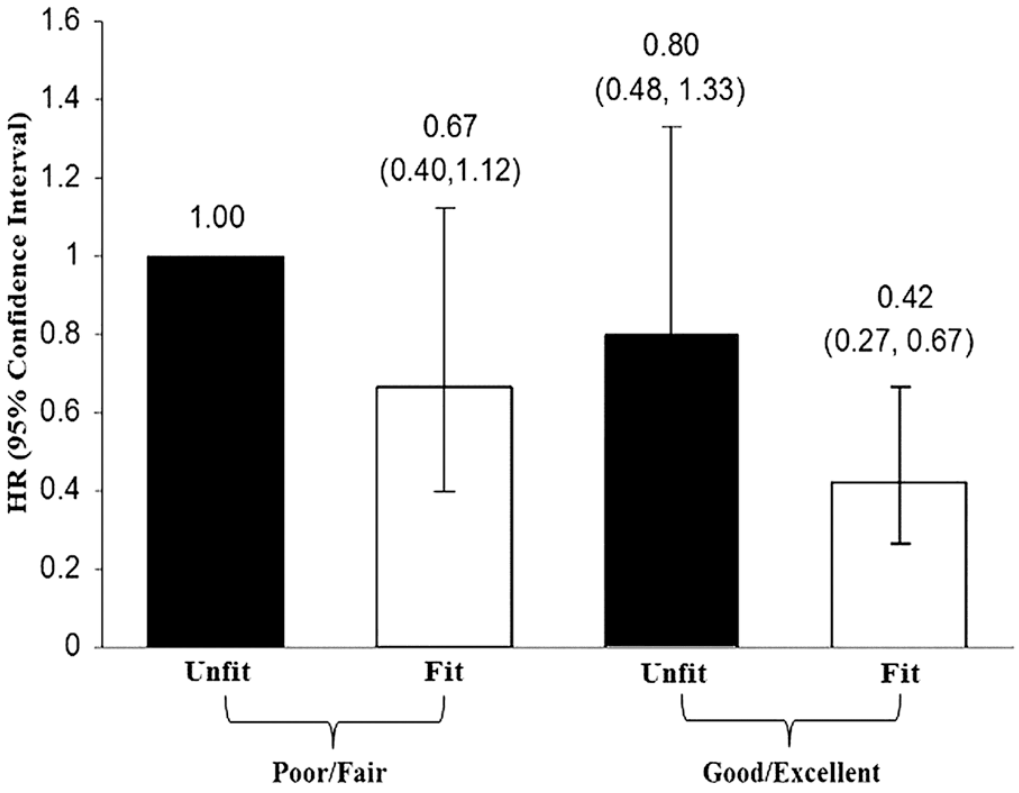

Figure 2.

Multivariate-adjusted hazard ratio (HR)* and 95% confidence interval (CI)* of all-cause mortality by levels of fitness and self-rated health (SRH). The two left bars represent Poor/Fair SRH while the two right bars represent Good/Excellent SRH. Unfit is represented by black bars and Fit is represented by white bars.

*Adjusted for age, examination year, body mass index, physical activity, smoking, alcohol consumption, abnormal electrocardiogram, cancer, cardiovascular disease, diabetes, hypertension, and hypercholesterolemia. The lines indicate 95% CIs and HRs are shown above the bars.

Table 1

Baseline Characteristics in 18,488 men across Self-Rated Health Categories, ACLS 1987–2003

	Overall Self-Rated Health			
	Poor/Fair	Good	Excellent	P Value
	(n=3,189)	(n=10,344)	(n=4,955)	
Age, mean (SD), y	43.8 (9.3)	45.9 (9.3)	46.6 (9.5)	<0.001
Age, No. (%)				
20–39	1,039 (32.6)	2,625 (25.4)	1,091 (22.0)	<0.001
40–59	1,988 (62.3)	6,873 (66.4)	3,393 (68.5)	<0.001
≥60	162 (5.1)	846 (8.2)	471 (9.5)	<0.001
BMI, mean (SD) [a]	29.6 (5.1)	27.2 (3.7)	25.6 (2.9)	<0.001
BMI, defined weight groups, No. (%)				
<25	496 (15.6)	2,870 (27.7)	2,234 (45.1)	<0.001
25.0–29.9	1,406 (44.0)	5,508 (53.3)	2,340 (47.2)	<0.001
≥30	1,287 (40.4)	1,966 (19.0)	381 (7.7)	<0.001
Treadmill Time (min), mean (SD)	15.0 (4.2)	17.7 (4.5)	20.6 (4.7)	<0.001
Fitness Group, No. (%)				
Low	1,046 (32.8)	1,074 (10.4)	139 (2.8)	<0.001
Moderate	1,564 (49.0)	4,490 (43.4)	1,116 (22.5)	<0.001
High	579 (18.2)	4,780 (46.2)	3,700 (74.7)	<0.001
Physical Activity Index, No. (%)				
Low	1,303 (40.9)	2,599 (25.1)	559 (11.3)	<0.001
Moderate	1,641 (51.4)	5,998 (58.0)	2,764 (55.8)	<0.001
High	245 (7.7)	1,747 (16.9)	1,632 (32.9)	<0.001
Smoking Status, No. (%)				
Never	1,786 (56.0)	6,436 (62.2)	3,302 (66.6)	<0.001
Former	667 (20.9)	2,358 (22.8)	1,180 (23.8)	0.01
Current	736 (23.1)	1,550 (15.0)	473 (9.6)	<0.001
Alcohol Consumption, No. (%)				
None	912 (28.6)	2,532 (24.5)	1,195 (24.0)	<0.001
Light	1,916 (60.1)	6,670 (64.5)	3,244 (65.5)	<0.001
Moderate	291 (9.1)	993 (9.6)	473 (9.6)	0.72
Heavy	70 (2.2)	149 (1.4)	43 (0.9)	<0.001
Fasting Blood Glucose, mean (SD), mg/dL	104.8 (31.1)	100.5 (17.0)	98.3 (12.4)	<0.001
Diastolic Blood Pressure, mean (SD), mmHg	85 (10)	83 (10)	81 (9)	<0.001
Systolic Blood Pressure, mean (SD), mmHg	125 (14)	123 (13)	122 (13)	<0.001
Chronic Medical Condition, No. (%)[b]				
Abnormal ECG	303 (9.5)	929 (9.0)	399 (8.1)	0.05
Cancer	171 (5.4)	619 (6.0)	284 (5.7)	0.41
Cardiovascular disease	62 (1.9)	128 (1.2)	31 (0.6)	<0.001
Diabetes	313 (9.8)	639 (6.2)	206 (4.2)	<0.001
Hypertension	1,464 (45.9)	3,619 (35.0)	1,309 (26.4)	<0.001

	Overall Self-Rated Health			P Value
	Poor/Fair	Good	Excellent	
	(n=3,189)	(n=10,344)	(n=4,955)	
Hypercholesterolemia	758 (23.8)	1,900 (18.4)	689 (13.9)	<0.001

Abbreviations: BMI, body mass index, ECG, electrocardiogram

[a] Calculated as weight in kilograms divided by height in meters squared

[b] Abnormal ECG (physician-diagnosed abnormal electrocardiogram); Cancer (physician-diagnosed cancer); or cardiovascular disease (physician-diagnosed cardiovascular disease [myocardial infarction or stroke]); or diabetes (physician-diagnosed diabetes, use of insulin, or measured fasting glucose level ≥126 mg/dL [7.0mmol/L]); or hypertension (physician-diagnosed or resting systolic blood pressure ≥140 mmHG or diastolic blood pressure ≥90mmHG); or hypercholesterolemia (physician-diagnosed of high cholesterol or measured fasting total cholesterol level ≥240 mg/dL [6.2 mmol/L])

Table 2

Adjusted Relative Risks for All-Cause Mortality by Self-rated Health Group or by Fitness Group

	N	Number of Death	Death Rate[a]	HR (95% CI)[b]	HR (95% CI)[c]	HR (95% CI)[d]
Self-Rated Health						
Poor/Fair	3,189	64	31.8	1.00	1.00	1.00
Good	10,344	140	16.7	0.52 (.039,0.71)	0.64 (0.47,0.88)	0.71 (0.52,0.97)
Excellent	4,955	58	13.2	0.41 (0.29,0.59)	0.61 (0.41,0.90)	0.71 (0.52,0.97)
***P* value for trend**				<0.001	0.015	0.09
Fitness						
Low	2,259	63	40.6	1.00	1.00	1.00
Moderate	7,170	103	18.4	0.45 (0.33,0.62)	0.57 (0.41,0.79)	0.60 (0.43,0.84)
High	9,059	96	12.8	0.32 (0.23,0.43)	0.43 (0.29,0.65)	0.47 (0.31,0.71)
P value for trend				<0.001	<0.001	<0.001

Abbreviations: HR, hazard ratio; CI, confidence interval

[a] Deaths per 10,000 person-years of follow-up adjusted for age and examination year

[b] Adjusted for age, examination year

[c] Adjusted for age, examination year, BMI, physical activity, smoking, alcohol consumption, abnormal ECG, cancer, cardiovascular disease, diabetes, hypertension, and hypercholesterolemia

[d] Further adjusted for fitness for SRH or SRH for fitnes

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